# Petrology of Late Cretaceous (ca. 90 Ma) lamprophyric dykes from north Greenland[1]

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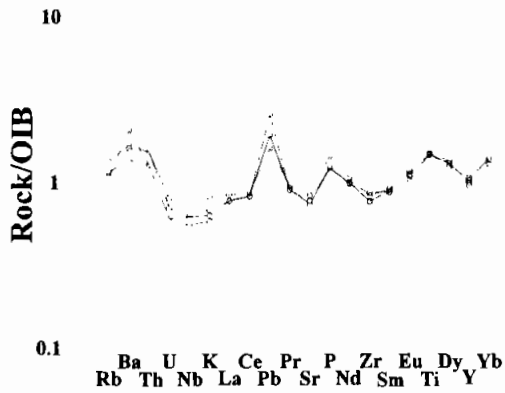
Mafic dykes cutting deformed lower Paleozoic sedimentary rocks of the Franklinian Basin have been sampled north of Frigg Fjord and Harebugt just off Frederick E. Hyde Fjord, northern Greenland. The dykes, forming the southern part of an extensive Cretaceous dyke swarm, can be related to a mantle plume that was responsible for extensive Cretaceous-Tertiary magmatism and basin formation in northern Greenland.

**Normalized plot of most primitive dyke rocks.**




The dykes (1-15 m wide, 10s-100s m long) outcrop as massive, fine-grained rocks with chilled margins and, in some cases, vesicular textures infilled with white to rusty brown carbonate±Py. Dyke orientations vary from 135-155°/50-90°SW at Frigg Fjord to 060-080°/60-90°S at Harebugt Fjord. Petrographically the dykes are characterized by ophitic textures and are dominated by Opx-Pl-Ilm-Ap±Ol±Bt±Kf; both Cpx and Pl are strongly zoned and Ilm varies from equant to skeletal. A single dyke sample containing abundant granophyre surrounding zoned calcic plagioclase represents the most evolved composition. Alteration varies considerably (i.e. 0.05 to 6.6 wt.% $CO_2$) such that pristine to extensively altered material is represented; secondary minerals are Ms, Chl, Ab, Kf ($Or_{93-100}$), Fe-Mg-Mn carbonate, Fe oxides, iddingsite, Srp, Py. Mineral chemistry is as follows: Pl zoned from core ($An_{74-55}$) to rim ($An_{55-35}$) with ≤1.5 wt.% BaO, but $An_{0-20}$ in granophyres. Cpx is titaniferous augite with ≤4.1 wt.% $TiO_2$ and mg = 0.70±0.04 with substitution following Si ⇔ Ca+Al+Ti (r=0.98). Rare Opx has mg = 0.69±0.05 and is always corroded, whereas for Ol mg = 0.31 to 0.69 and single grains are strongly zoned ($Fo_{69-35}$). Bt has mg = 0.33 ± 0.03, is both F and Cl poor, and has 5 wt.% $TiO_2$. Major and trace element chemistry for least evolved samples (anhydrous, recalculated to 100%) are uniform at: (1) 45-47 wt.% $SiO_2$, 4.1 wt.% $TiO_2$, 15 wt.% $Fe_2O_3$(T), 2.8 wt.% $Na_2O$, 0.9 wt.% $K_2O$, 0.8 wt.% $P_2O_5$, and ≤0.03 and≤0.08 wt.% Cl and F, respectively; (2) trace elements (ppm) are Rb=35, Sr=500, Ba=5600, Zr=220, Nb=28, Ni=45, Cr=75, V=330; (3) REE are enriched ($La_N$=90, ∑14REE=175 ppm), strongly fractionated [$(La/Lu)_N$=7] and Eu/Eu*=0.96. Both major and trace element variations reflect crystal fractionation dominated by Cpx+Pl+Ilm. Tectonic discriminant diagrams, based on both whole-rock and Cpx chemistry, and the LILE, HFSE and REE data are generally consistent with a within-plate setting, whereas OIB-normalized spidergram plots are close to unity (see Figure). Thus, both the chemical and mineralogical data are consistent with features of the lamprophyric association. $^{40}Ar/^{39}Ar$ dating of whole-rock material indicates an age of 90 ± 5 Ma for the magmatism.

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